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AGE, SEX, AND IQ DIFFERENCES IN PERFORMANCE ON A CONCRETE PERCEPTUAL-COGNITIVE TASK.

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AGE, SEX, AND IQ DIFFERENCES IN THE CHARACTERISTICS OF THE CONCEPTUAL PERFORMANCE OF ELEMENTARY SCHOOL CHILDREN WERE STUDIED. PERFORMANCE MEASURES WERE OBTAINED THROUGH THE USE OF DUNN'S OBJECT SORTING TASK (OST) WHICH PROVIDED SUCH INDICATORS AS SIZE OF THE COGNITIVE MATRIX, ACCESSIBILITY OF THE CONCEPTS IN THE MATRIX, AND DEGREE OF PRECISION IN THE VERBAL REPRESENTATION OF THE CONCEPTS IN THE MATRIX. THE SAMPLE CONSISTED OF 99 UPPER MIDDLE CLASS ELEMENTARY SCHOOL CHILDREN WITH A MEAN STANFORD BINET IQ OF 126. THE RELATIVE CONTRIBUTIONS OF AGE, SEX, AND IQ TO OST PERFORMANCE PATTERNS WERE ASSESSED BY ANALYSIS OF VARIANCE AND A FILTER MEANS PROGRAM. THE RESULTS OBTAINED WERE SUGGESTIVE OF DIFFERENTIAL EFFECTS OF AGE AND IQ LEVELS ON COGNITIVE PERFORMANCE. FOR GIRLS, LEVEL OF IQ WAS NOT ASSOCIATED WITH CONCEPT FORMATION AND UTILIZATION ON THE TASK, WHEREAS AGE WAS. THE OPPOSITE WAS TRUE FOR BOYS. THE COMPLEX PATTERNS OF INTERACTION BETWEEN AGE, SEX, AND IQ SUGGEST THE NEED FOR FURTHER RESEARCH. THIS DOCUMENT APPEARED AS STUDY 4 IN SCHOOL ANXIETY AND COGNITIVE FUNCTIONING/ EXPLORATORY STUDIES, REPORT 4, IRCOPPS MIDWEST RESEARCH CENTER FOR PUPIL PERSONNEL SERVICES, ANN ARBOR, MICHIGAN, PP. 131-140. (PS)

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SCHOOL ANXIETY AND COGNITIVE FUNCTIONING: EXPLORATORY STUDIES

University of Michigan

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IRCOPPS MIDWEST RESEARCH CENTER
FOR PUPIL PERSONNEL SERVICES

SCHOOL ANXIETY AND COGNITIVE FUNCTIONING: EXPLORATORY STUDIES

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PREFACE

This report is the fourth in a series of research monographs published by the IRCOPPS Midwest Research Center. A survey of Center activities plus a comprehensive synopsis of the Center's project reports may be found in the Center's 1967 Summary Status Report.

The present monograph reports the results of eight modular pilot studies conducted by various center staff. All research was supported by NIMH Grant #01428. Several of the studies have been presented, in abbreviated form, at various professional meetings and certain of the results have already appeared, or are due to appear, as short published articles.

Appreciation is expressed to the various staff associated with the production of these reports.

James A. Dunn
Director
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STUDY IV

AGE, SEX, AND IQ DIFFERENCES IN PERFORMANCE ON A CONCRETE PERCEPTUAL-COGNITIVE TASK

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Perceptual and cognitive differences in both the development and habitual styles of boys and girls has received increased attention in recent years (See Kagan & Moss, 1962; and Kagan, 1964). These and other studies suggest that the rate of intellective maturation of girls, like the rate of physical and socio-emotional maturation, exceeds that of boys until sometime during adolescence when boys catch up with, and surpass, their female counterparts.

The general picture suggests: (1) differential pacing for the two sexes, with girls reaching certain criteria of competence earlier than boys; (2) leveling off of the growth curve about the time of puberty or shortly thereafter; (3) female dominance on each criterion of intellective growth until adolescence; and (4) later, male dominance on the criteria after adolescence.

Sex differences in preferences for academic activities and in aptitudes for those activities have long been observed. Throughout elementary school, for example, girls are better readers than boys, and show more aptitude for the language arts. Boys, on the other hand,

are better and more interested in science and mathematics. Such differences are most often ascribed to sex-typing and sex-role identification (See Kagan, 1964).

It is assumed that, if such substantive area preference and abilities are to be understood, better knowledge of the patterns of cognitive growth itself must be obtained. Recent research has suggested that concepts play an extremely important role in cognitive functioning. Harvey, Hunt, and Schroder (1961), for example, have referred to the conceptual network which evolves in the course of an individual's interaction with his environment as an "experiential filter" which serves to facilitate learning and adaptation. Sigel (1964) has recently summarized the important role played by such concepts as those representing relationships between objects and phenomena of the physical world in children's cognitive development.

The purpose of the present study was to investigate age, sex, and IQ differences in characteristics of the conceptual performance of elementary school children. Performance measures were obtained through the use of an object sorting task, which provided such indicators as: size of the cognitive matrix, accessibility of the concepts in the matrix, and degree of precision in the verbal representation of the concepts in the matrix.

METHOD

Subjects were 99 upper-middle class elementary school children with a mean Stanford-Binet (Form L-M) IQ of 126 (SD-19). Ten males and ten females were drawn from each of grades 1, 2, 3, 4, and 6. (One subject was eliminated from the sample due to incomplete data).

Cognitive functioning was measured in terms of scores on various dimensions of Dunn's Object Sorting Task (OST). The OST is an individually administered task wherein the subject is asked to sort 6 abstract geometric shapes (plastic blocks) into as many successive, equal, conceptually dichotomous groups as possible. The task was administered by two advanced doctoral students in clinical psychology.[1] Testing ranged from 15 to 30 minutes for each subject. After each sort, the subject was asked to explain his basis for sorting. The first phase of testing, the divergent testing phase, was terminated when the subject could produce no more sorts, when he exceeded the number of allowable duplicate sorts, or when he exceeded 120 seconds in sorting.

The more important measures of the task pertain to: (1) how many ways a subject can sort the objects; and (2) the nature and level of his verbal explanations. Thus, both the quantity and the level of sophistication of categorization are measured.

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[1]Robert Egri and Robert Goldberg

Variables corresponding to those dimensions were examined first for developmental trends. Then separate analyses were conducted for sex and IQ differences.

The OST scores used were: (1) number of correct sorts; (2) the ratio of number of correct sorts to total number of sorts; (3) a total verbalization score, obtained by summing the numerical values, (ranging from 0 to 4) assigned each "pole" of an S's explanation of a sort and (4) a mean verbalization score, obtained by dividing the total verbalization score by the number of correct sorts.

The relative contributions of age, sex, and IQ to OST performance patterns were assessed via analysis of variance, and a filter means program, run on the University of Michigan's 7090 IBM computer.

GENERAL HYPOTHESES

(1) Number of correct sorts was expected to increase with age. Also, since total verbalization scores were not independent of number of correct sorts, a parallel trend was predicted for this variable.

(2) More intelligent subjects were expected to produce more correct sorts and have greater verbalization scores than subjects of average IQ.

(3) Younger girls were expected to produce more and better verbalized sorts than boys. And finally,

(4) Older boys were expected to exceed girls in number and quality of sorts.

RESULTS

Hypotheses 1 and 2 were substantiated. Older subjects did produce more correct sorts and have greater verbalization scores than younger subjects. Similar results were obtained for high and low IQ groups. The results are summarized in Figures 1 and 2 (for age) and Figures 3 and 4 (for IQ).

When age trends for boys and for girls were considered separately, it was found that girls produced more correct sorts than boys at earlier levels, but plateaued very rapidly. Leveling-off appeared at approximately eight years of age. The predicted "catching-up" on the part of the boys was also somewhat earlier than expected. These patterns are graphed in Figure 5.

The patterns of spurts and plateaus resulted in a significant increase with age in number of correct sorts for girls but not for boys. After surpassing girls at a relatively early point, the performance of boys remained stable through the remaining elementary school grades.

When IQ effects were analyzed by sex a strong linear relationship was found between IQ and number of correct sorts--but only for boys. (See Figure 6).

Across age levels, the brightest boys in the sample averaged almost five positive sorts, the middle IQ group

(IQ's between 119 and 135) averaged four, and the lowest IQ group (IQ's less than 119) averaged only three. For girls, IQ level had no apparent effect on the number of correct sorts performed on the task.

A subject's mean verbalization score, in contrast to his total verbalization score, can be used as an indicator of his level of conceptual sophistication. It was assumed that level of verbal sophistication would increase with time as did extent of verbal capability. However, as figures 7 and 8 suggest, mean verbalization scores do not increase significantly as a function of CA for any IQ or sex sub-group.

One sex difference in verbalization was suggested. At age 6, boys and girls were widely discrepant in terms of their average ability to justify a sorting arrangement verbally. Thereafter, convergence of verbal performance created by a sudden, although not significant, drop in the performance of 7 year old girls and a simultaneous, though not significant, upward spurt in the performance of boys, followed a relatively unbroken course. These results were, of course, too tenuous to warrant more than speculation.[1]

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[1]Research is under way to investigate more fully these age-sex differences at the kindergarten and early elementary school levels.

CONCLUSIONS AND IMPLICATIONS

In summary, both sorting proficiency and total verbalization scores, when considered in terms of the entire sample, were related to both chronological age and to IQ. When trends for each sex were considered, however, the relationship between object sorting and verbal explanations of sorting appeared to be associated with different developmental factors. For girls, the age relationship was the stronger; IQ did not contribute significantly to the OST performance of girls. For boys, on the other hand, IQ did contribute, whereas age level did not.

The results obtained for each sex in terms of average verbalization may provide some clue in attempts to evaluate these findings. It might be hypothesized that the salient aspects of the initial impact of the school experience differ for the two sexes. For boys initial exposure to schooling may open new paths of activity which give impetus to conceptual growth. Girls, on the other hand, may become suddenly aware of culturally-imposed sex-role standards which act as a check on the achievement motive. Thus, the brightest boys would be expected to move ahead; the brightest girls, however, would be expected to inhibit performance as sex-role standards are learned, and would not surpass girls of lower IQ.

In summary, the objectives of the present study were to investigate differences in the conceptual functioning of boys and girls in an upper-middle class elementary school.

The results obtained were strongly suggestive of differential effects of age and IQ-level on cognitive performance. For girls, level of IQ was not associated with concept formation and concept utilization on the task, whereas age was. For boys, the opposite was true.

The Object Sorting Task appears to have been a useful procedure in the investigation of children's conceptual behavior. The complex patterns of interactions between age, sex and IQ suggest the need for further research aimed at gaining a better understanding of their role in determining intellectual ability.

REFERENCES

Harvey, O. J., Hunt, D. E. and Schroder, H.M. Conceptual systems and personality organization. New York: Wiley, 1961.

Kagan, J. Sex-typing and sex-role identity. In M. L. Hoffman and Lois W. Hoffman (Eds.), Review of child development research, I. New York: Russell Sage Foundation, 1964. pp. 137-167.

Kagan, J. and Moss, H. Birth to maturity. New York: Wiley, 1962.

Sigel, I. E. The attainment of concepts. In M. L. Hoffman and Lois W. Hoffman, (Eds.), Review of child development research, I. New York: Russell Sage Foundation, 1964. pp. 209-248.